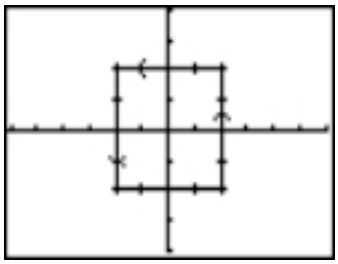
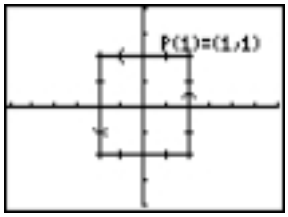
Bug on a Square Track

Suppose a bug travels counterclockwise around a square track as shown:

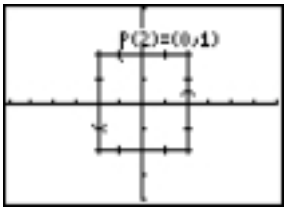


Assume the bug begins at the point (1,0) and walks **t** units along the square , carefully staying on the track. Let **P(t)** be the point **(x,y)** on the square which is the location of the bug after it has walked exactly **t** units from (1,0), travelling counterclockwise.

For example, 1. When t=1, P(1) = (1,1)



2. When t=2, P(2) =(0,1)



Question: How far does the bug have to travel to go around the square exactly once? t= _____

We want to create a correspondence between the **distance t that the bug has travelled** and the **location point P(t) on the square** which represents the bug's position. Complete the table shown below.

t	0	.5	1	1.5	2	2.5	3	3.5	4
P(t)			(1,1)		(0,1)				

t	4.5	5	5.5	6	6.5	7	7.5	8	8.5
P(t)									

Questions:

1. The ordered pair which corresponds to t = 8.5 is the same as the ordered pair for t = _____.

2. The ordered pair which corresponds to t = 13 is the same as the ordered pair for t = _____.

A function **C(t)** is defined as follows:

C(t) is the x-coordinate of the location point P(t).

For example, **C(1)=1** and **C(2)=0**. Using the table above, **C(1.5)** = _____ , **C(4)** = _____ , **C(5.5)** = _____

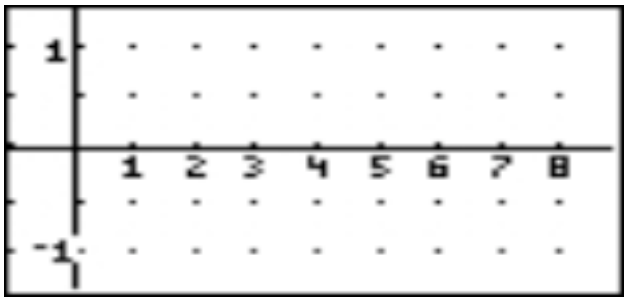
Also,a function **S(t)** is defined as follows:

S(t) is the y-coordinate of the location point P(t).

For example, **S(1) =1** and **S(2) = 1**. Using the table above, **S(1.5)** = _____ , **S(4)** = _____ , **S(5.5)** = _____

Let's create a **scatterplot** for the functions **y=C(t)** and **y=S(t)**. Enter the **t** values (**0≤t≤8)** from your chart into **L1** of your **List Editor**, the **x-coordinates** of the location point **P(t)** in **L2**, and the **y-coordinates** of the location point **P(t)** in **L3**.

Set up a **scatterplot** for the **t** values (L1) vs. the **x-coordinates** (L2). Show your scatterplot.

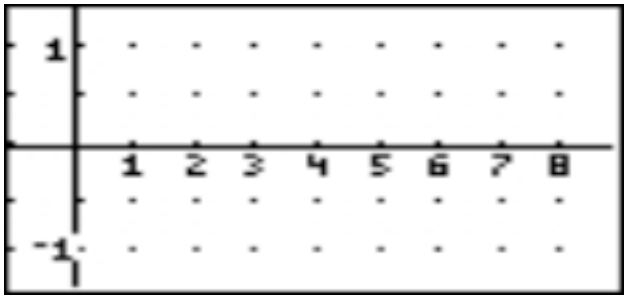


We want to graph the function **y=C(t)**. Connect the points on your scatterplot with straight line segments. (Note: This represents one complete trip around the square by the bug.)

The graph of **C(t)** can be defined as a **piecewise defined function**. Write a piecewise defined function which represents the function **y=C(t)**. (Extra: Can you graph the function y=C(t) on your graphing calculator?)

$$C(t) = \begin{cases} \\ \\ \\ \\ \end{cases}$$

Set up a **scatterplot** for the **t** values (L1) vs. the **y-coordinates** (L3). Show your scatterplot.



We want to graph the function **y=S(t)**. Connect the points on your scatterplot with straight line segments.

Again, write a **piecewise defined function** which represents the function **y=S(t)**. (Extra: Can you graph the function y=S(t) on your graphing calculator?)

$$S(t) = \begin{cases} \\ \\ \\ \\ \end{cases}$$